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Attorney Docket No. TI-33260

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Patricia B. Smith et al.

Application No.: 10/647,985

Art Unit.: 1746

Date Filed: August 26, 2003

Examiner: Zeinab El Arini

For: POST-ETCH CLEAN PROCESS FOR POROUS LOW DIELECTRIC
CONSTANT MATERIALS

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF

Attached herewith, is the APPEAL BRIEF in this application, with respect to the Notice of Appeal filed on December 15, 2006.

The Commissioner is authorized to charge any fees which may be required by this notice, or credit any overpayment, to Deposit Account No. 20-0668, TI-33260. (Enclosed is a duplicate copy of this sheet).

Applicant believes that no extension of term is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition for extension of time.

Respectfully submitted,
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CERTIFICATE OF MAILING

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Date February 15, 2007


Christine Gillroy



Docket No. TIP477US

TI-33260

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re **PATENT** application of:

Applicant: Patricia B. Smith *et al.*

Application No.: 10/647,985

For: POST-ETCH CLEAN PROCESS FOR POROUS LOW
DIELECTRIC CONSTANT MATERIALS

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Art Unit: 1746

APPEAL BRIEF

**Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450**

Dear Sir:

Applicants submit this brief in connection with the appeal of the above-identified case.

I. Real Party in Interest (37 C.F.R. § 41.37(c)(1)(i))

The real party in interest in the present appeal is Texas Instruments Incorporated.

II. Related Appeals and Interferences (37 C.F.R. § 41.37(c)(1)(ii))

Appellants, appellants' legal representatives, and/or the assignee of the present application are unaware of any appeals or interferences which will directly affect, or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. Status of Claims (37 C.F.R. § 41.37(c)(1)(iii))

Claims 1-6, 8-15, 17-18, and 20 are pending in the application. Claims 7, 16 and 19 were cancelled in previous office actions. The rejection of claims 1-6, 8-15, 17-18, and 20 is appealed.

IV. Status of Amendments (37 C.F.R. § 41.37(c)(1)(iv))

No claim amendments have been entered subsequent to the final rejection.

V. Summary of Claimed Subject Matter (37 C.F.R. § 41.37(c)(1)(v))

As set forth in claim 1, a method for cleaning a wafer is illustrated in FIG. 1. (See, e.g., specification, page 2, paragraph [0006]).

The method comprises patterning a via 106 or a trench 108, or both, in a porous, low-k dielectric layer 102 overlying the wafer 100 as illustrated in FIG. 1. (See, e.g., page 3, paragraph [0011] and page 4, paragraph [0012]). A polymer residue is then cleaned from surfaces of the patterned dielectric layer 102 using a wet clean solvent as illustrated in FIG. 1. (See e.g., page 3, paragraph [0011] and page 5, paragraph [0014]). A non-plasma anneal is then performed on the patterned dielectric layer to remove a component of the solvent prior to a metal 110 deposition, wherein the anneal comprises a low pressure anneal from about one atmosphere of pressure to substantial vacuum as illustrated in FIG. 1. (See, e.g., page 6, paragraphs [0015] and [0017], and page 7, paragraph [0020]).

As recited in claim 20, a method for removing volatile cleanser compounds from a post-etch substrate 100, is disclosed. (See, e.g., page 5, paragraph [0013] and page 6, paragraph [0017]). A plasma strip of an exposed low k dielectric material 102 is performed to remove a photoresist residue after an etching of the material. (See, e.g., page 5, paragraph [0013]). A wet clean process is then performed using a fluorine-based solvent to remove a polymer residue of the plasma strip from the material, as illustrated in FIG.1. (See e.g., page 5, paragraph [0014]). The method further comprises performing a low-pressure, high-temperature, limited-duration anneal after the wet clean process and prior to a metal 110 barrier deposition to remove a

component of the fluorine-based solvent from the material, wherein the anneal is exclusive of an application of a plasma generated from one or more of: a radio-frequency (RF) radiation and a microwave radiation, as illustrated in FIG.1. (See e.g., page 5, paragraph [0013]).

VI. Grounds of Rejection to be Reviewed on Appeal (37 C.F.R. § 41.37(c)(1)(vi))

Claims 1-6, 8-15, 17-18 and 20 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Publication No. 2003/0008518 (Chang *et al.* '518) or U.S. Patent No. 6,107,202 (Chiu *et al.*) or U.S. Patent Publication No. 2003/0104320 (Nguyen *et al.*) in combination with U.S. Patent Application No. 5,643,407 (Chang *et al.* '407) and Patent Publication No. 2002/0058397 (Smith *et al.*).

VII. Argument (37 C.F.R. § 41.37(c)(1)(vii))

A. REJECTION OF CLAIMS 1-6, 8-15 AND 17-18 UNDER 35 U.S.C. § 103(a)

Claims 1-6, 8-15 and 17-18 stand rejected under 35 U.S.C. 103(a) as being obvious over U.S. Patent Publication No. 2003/0008518 (Chang *et al.* '518) or U.S. Patent No. 6,107,202 (Chiu *et al.*) or U.S. Patent Publication No. 2003/0104320 (Nguyen *et al.*) in combination with U.S. Patent Application No. 5,643,407 (Chang *et al.* '407) and Patent Publication No. 2002/0058397 (Smith *et al.*). A reversal of the rejection is respectfully requested for at least the following reasons.

i. Smith et al. and Chang et al. '407, which are cited in each combination, are not properly combinable.

As admitted in the *Final Office Action*, neither Chang *et al.* '518 nor Chui *et al.* nor Nguyen *et al.* teach a method for cleaning a wafer, comprising performing a *low pressure non-plasma anneal* on the patterned dielectric layer to remove a component of the solvent prior to a metal deposition, wherein the anneal comprises *from about one atmosphere of pressure to substantial vacuum*, as claimed in claim 1. (See,

e.g., O.A., 09/15/06, p. 3, Section 3, ¶3). Accordingly, the combination of Smith *et al.* and Chang *et al.* '407 are relied upon for these features.

In order to arrive at the present invention, one of ordinary skill in the art must have been ***motivated to modify Smith et al. and Chang et al. '407.*** It is conceded that such motivation may be found in the references themselves, in the nature of the problem to be solved, or in the knowledge generally available to one skilled in the art. MPEP § 2143.01, citing to In re Kotzab, 217 F.3d 1365, 55 USPQ2d 1313 (Fed. Cir. 2000). ***Nevertheless, such motivation and the source thereof may not be conclusory, but rather the showing must be clear and particular.*** In re Dembiczak, 175 F.3d 994; 50 USPQ2D 1614 (Fed. Cir. 1999). It is respectfully submitted that upon a proper analysis of the cited art, and application of the appropriate standard enunciated above, pending claim 1 is non-obvious over the cited art.

The cited references themselves provide no teaching that would motivate one of ordinary skill in the art to make modifications thereto in accordance with the present invention. Rather, the teachings within the cited references, when properly considered as a whole, would discourage the suggested combination. In particular, Smith *et al.* teach that in fabricating an electronic device the ***use of any oxygen is excluded due to the deleterious effects of oxygen*** based plasma on carbon containing oxide. This can cause the carbon containing oxide to lose carbon, showing degradation in low k materials using standard photoresist removal processes (e.g., O₂, 250⁰C) (See paragraphs 5 and 24). In contrast, Chang *et al.* '407 teach the ***use of oxygen both in the wet strip process, hydroxylamine (NH₂OH), and the optional step of O₂ plasma ashing*** (See e.g., Col. 3, lines 17-22). The cited art provides no teaching or suggestion to combine these references or any advantages associated therewith. Rather, Smith *et al.* specifically exclude the use of oxygen in the photoresist process, whereas Chang *et al.* '407 teach the use of oxygen in the photo-mask removal process. Therefore one of ordinary skill in the art would not be motivated to combine together the cited references.

Therefore it is inappropriate to combine the teaching of Smith *et al.* and Chang *et al.* '407, as the office action suggests, in order to reconstruct applicants' claim. Therefore it is respectfully submitted that claim 1 is non-obvious over the cited art.

Accordingly, a reversal of the rejection of claim 1 and its associated dependant claims is respectfully requested.

ii. Chang et al. '518, Smith et al. and Chang et al. '407 are not properly combinable.

As discussed *supra*, Smith et al. teach that in fabricating an electronic device the **use of any oxygen is excluded** due to the harmful effects of oxygen based plasma upon carbon containing oxide. The carbon containing oxide can lose carbon, showing degradation in low k materials using standard photoresist removal processes (See e.g., paragraphs 5 and 24). In contrast, Chang et al. '518 and Chang et al. '407 both teach the **utilization of oxygen in the various processes**. Chang et al. '407 teach the **use of oxygen both in the wet strip process, hydroxylamine (NH₂OH), and the optional step of O₂ plasma ashing** (See e.g., Col. 3, lines 17-22). Chang et al. '518 teach **oxygen plasma reacts with carbon** and hydrogen atoms in the photoresist layer to form gaseous carbon dioxide and water vapor so as to strip the photoresist layer (See e.g., paragraph 21). The cited art provides no teaching or suggestion to combine these references or any advantages associated therewith. Rather, Smith et al. specifically exclude the use of oxygen in the photoresist process, whereas Chang et al. '518 and Chang et al. '407 teach the use of oxygen plasma in the photoresist strip process. Therefore there is no motivation to combine Chang et al. '518 with Smith et al. and Chang et al. '407, and thus the proffered combination is improper.

iii. Chui et al., Smith et al. and Chang et al. '407 are not properly combinable.

As stated *supra*, Smith et al. teach the **exclusion of oxygen** due to the harmful effects of oxygen reacting with carbon containing oxide causing degradation of carbon in standard photoresist removal processes (See e.g., paragraphs 5 and 24). In contrast, Chui et al. teach performing a **first O₂ ashing treatment** of the photoresist pattern (See e.g., Col. 3, lines 26-27). As discussed *supra*, Chang et al. '407 teach the **use of oxygen both in the wet strip process, hydroxylamine (NH₂OH)**, and the

optional step of O₂ plasma ashing (See e.g., Col. 3, lines 17-22). The cited art provides no teaching or suggestion to combine these references or any advantages associated therewith. Rather, Smith *et al.* specifically exclude the use of oxygen in the photoresist process, whereas Chui *et al.* and Chang *et al.* '407 teach the use of oxygen in the photoresist strip process. Therefore there is no motivation to combine Chui *et al.* with Smith *et al.* and Chang *et al.* '407.

iv. Nguyen *et al.*, Smith *et al.* and Chang *et al.* '407 are not properly combinable.

As previously stated, Smith *et al.* teach the **exclusion of oxygen** due to the harmful effects of oxygen reacting with carbon containing oxide (See e.g., paragraph 5 and 24). Contrary to Smith *et al.*, Nguyen *et al.* teach removing a residue of the photoresist **using a plasma comprising hydrogen and H₂O (oxygen)** (See e.g., claims 6, 7 and 11). As discussed above, Chang *et al.* '407 teach the **use of oxygen both in the wet strip process, hydroxylamine (NH₂OH)**, and the optional step of O₂ plasma ashing (See e.g., Col. 3, lines 17-22). Therefore, the cited art provides no teaching or suggestion to combine these references or any advantages associated therewith. Rather, Smith *et al.* **specifically exclude the use of oxygen in the photoresist process**, whereas Nguyen *et al.* and Chang *et al.* '407 teach the **use of oxygen** in the photoresist strip process. Therefore there is no motivation to combine Nguyen *et al.* with Smith *et al.* and Chang *et al.* '407.

Based upon the findings above in sections ii, iii, and iv, it is inappropriate to combine the teaching of Chang *et al.* '518 or Chiu *et al.* or Nguyen *et al.* in combination with Smith *et al.* and Chang *et al.* '407, in order to reconstruct applicants' claim 1 because such combinations would render Smith *et al.* unsatisfactory for its intended purpose. § MPEP 2143.01(V) (*citing* In re Gordon, 733 F. 2d 900 (Fed. Cir. 1984)) (holding that when a proposed modification would render the prior art unsatisfactory for its intended purpose, there is no suggestion or motivation to make the proposed modification). Therefore it is respectfully submitted that claim 1 is non-obvious over the

cited art. Accordingly, a reversal of the rejection of claim 1 and its associated dependant claims is respectfully requested.

v. ***Assuming arguendo that Smith et al. is removed from the various combination of references, the other cited references are not properly combinable. Neither Chang et al. '518 nor Chiu et al. nor Nguyen et al. in combination with Chang et al. '407 are obvious over claim 1.***

To make a suggested combination, one of ordinary skill in the art must have been motivated to modify the cited references, where such motivation may be found in the references themselves, in the nature of the problem to be solved, or in the knowledge generally available to one skilled in the art. MPEP § 2143.01, (*citing In re Kotzab*, 217 F.3d 1365, 55 USPQ2d 1313 (Fed. Cir. 2000)). Nevertheless, such motivation and the source thereof may not be conclusory, but rather ***the showing must be clear and particular.*** *In re Dembiczak*, 175 F.3d 994; 50 USPQ2D 1614 (Fed. Cir. 1999). It is respectfully submitted that upon a proper analysis of the cited art, and application of the appropriate standard enunciated above, pending claim 1 is non-obvious over the cited art.

a. ***Chang et al. '518 and Chang et al. '407 are not properly combinable.***

Chang et al. '518 teach a method to ***avoid deterioration*** of a dielectric characteristic of a dielectric layer having a low dielectric constant (low k) ***during a stripping process.*** (See e.g., abstract). Furthermore, Chang et al. '518 teach the use of HMDS to ***repair the surface of the low k dielectric layer that is damaged during the stripping process*** (See e.g., paragraph 12). In contrast, Chang et al. '407 teach that once the via etching is complete, the ***photoresist mask is removed using a wet strip***, such as hydroxylamine (See e.g., Col. 3, lines 19-20). Chang et al. '407 teach a method of forming an intermetal dielectric layer of an integrated circuit that does not result in poisoned via metallurgy. Consequently, Chang et al. '407 is ***silent with***

respect to a process step to repair the surface of the low k dielectric layer that is damaged during the stripping process because no repair is necessary. There would be no motivation in Chang *et al.* '407 to create an additional process step to repair damage to the dielectric layer that had not been identified. Therefore one of ordinary skill in the art would not be motivated to combine together Chang *et al.* '407 and Chang *et al.* '518.

Therefore it is inappropriate to combine the teaching of Chang *et al.* '407 and Chang *et al.* '518 in reconstructing applicants' claim 1.

b. Chui *et al.* and Chang *et al.* '407 are not properly combinable to teach all of the features as recited in claim 1.

Chiu *et al.* teach a method for **stripping positive photoresist residues from a wafer and more particularly to a process for stripping photoresist residues from a keyhole in a passivation layer before or prior to a heating process.** (See e.g., abstract, Col. 3, lines 2-7). In contrast, Chang *et al.* '407 teach that a photoresist mask is removed using a wet strip, such as hydroxylamine, followed by an O₂ plasma ashing at a temperature of between about 170⁰ to 275⁰ C (See e.g., Col. 3 lines 17-32). In other words, Chang *et al.* '407 teach a **stripping process and a heating process to remove the photoresist**, where in contrast Chiu *et al.* teach only a wet stripping process to remove the photoresist residues. Thus Chang *et al.* '407 do not ensure that the photoresist residue is completely removed, as in Chiu *et al.*, **before** performing a heating process.

Therefore, both Chiu *et al.* and Chang *et al.* '407 are not properly combinable in reconstructing applicants' claim 1.

c. Nguyen *et al.* and Chang *et al.* '407 are not properly combinable to teach all of the features as recited in claim 1.

The references of Nguyen *et al.* and Chang *et al.* '407 are not properly combinable. In particular, Nguyen *et al.* use a method to **eliminate the wet strip process to lower cost and avoid solvent handling** (See e.g., paragraph 9). In

contrast, Chang *et al.* '407 teach that once the via etching is complete, ***the photoresist mask is removed using a wet strip*** (See e.g., claim 7). Obviously, a clear emphasis of Nguyen *et al.* is in overcoming the wet strip process whereas Chang *et al.* '407 utilizes a wet strip as part of the overall method. It is respectfully submitted that, taken as a whole, one of ordinary skill in the art would not look to a design that adds a wet process as in Chang *et al.* '407 to a process as in Nguyen *et al.* which clearly eliminates that very step.

The standard for ascertaining whether a combination is appropriate is whether a clear and particular motivation may be found in the references themselves, in the nature of the problem to be solved, or in the knowledge generally available to one skilled in the art. In re Vaeck, 947 F.2d 488; In re Dembiczkak, 175 F.3d 994; 50 USPQ2D 1614 (Fed. Cir. 1999); MPEP § 2142. Since the references have divergent goals, any motivation to make the suggested combination is clearly lacking in the references themselves and in the art generally. Accordingly, to the extent that any such motivation exists, it is most certainly inspired by the pending claims, and thus makes use of impermissible hindsight where the pending claims are substituted for the necessary motivation.

As such, as outlined in ***section V, subsections a, b, and c***, "Chang *et al.* '518 and Chang *et al.* '407" or "Chiu *et al.* and Chang *et al.* '407" or "Nguyen *et al.* and Chang *et al.* '407" are not properly combinable due to the lack of the requisite motivation. Therefore it is respectfully submitted that claim 1 is non-obvious over the cited art. Accordingly, withdrawal of the rejection with respect to claim 1 is respectfully.

B. REJECTION OF CLAIM 20 UNDER 35 U.S.C. § 103(a)

Claim 20 was rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Publication No. 2003/0008518 (Chang *et al.* '518) or U.S. Patent No. 6,107,202 (Chiu *et al.*) or U.S. Patent Publication No. 2003/0104320 (Nguyen *et al.*) in combination with U.S. Patent Publication No. 2002/0058397 (Smith *et al.*), and U.S. Patent No. 5,643,407 (Chang *et al.* '407). Withdrawal of the rejection of claim 20 is respectfully requested for at least the following reasons.

i. Smith et al. and Chang et al. '407 are not properly combinable.

It is admitted in the Office Action that neither Chang *et al.* '518 nor Chui *et al.* nor Nguyen *et al.* teach the low pressure anneal, the temperature, the time and the acid as disclosed in claim 20. Accordingly, as discussed *supra*, the combination of Smith *et al.* and Chang *et al.* '407 are relied upon for these features.

As discussed *supra*, it is inappropriate combine the teaching of Smith *et al.* and Chang *et al.* '407, as the office action suggests, in order to reconstruct applicants' claim. Therefore it is respectfully submitted that claim 20 is non-obvious over the cited art. Accordingly, a reversal of the rejection of claim 20 is respectfully requested.

ii. Chang et al. '518, Smith et al. and Chang et al. '407 are not properly combinable.

As discussed *supra*, there is no motivation to combine Chang *et al.* '518 with Smith *et al.* and Chang *et al.* '407. Accordingly, a reversal of the rejection of claim 20 is respectfully requested.

iii. Chui et al., Smith et al. and Chang et al. '407 are not properly combinable.

As discussed *supra*, here is no motivation to combine Chui *et al.* with Smith *et al.* and Chang *et al.* '407.

iv. Nguyen et al., Smith et al. and Chang et al. '407 are not properly combinable.

Based upon the findings above in sections ii, iii, and iv, it is inappropriate combine the teaching of Nguyen *et al.* in combination with Smith *et al.* and Chang *et al.* '407, in order to reconstruct applicants' claim 20. Therefore it is respectfully submitted that claim 20 is non-obvious over the cited art. Accordingly, a reversal of the rejection of claim 20 is respectfully requested.

v. ***Assuming arguendo that Smith et al. is removed from the various combination of references, the other cited references are not properly combinable. Neither Chang et al. '518 nor Chiu et al. nor Nguyen et al. in combination with Chang et al. '407 are obvious over claim 20.***

It is respectfully submitted that upon a proper analysis of the cited art, and application of the appropriate standard enunciated above, pending claim 20 is non-obvious over the cited art.

a. ***Chang et al. '518 and Chang et al. '407 are not properly combinable.***

As discussed *supra*, there is no motivation to combine Chang *et al.* '518 and Chang *et al.* '407. Therefore it is inappropriate to combine the teaching of Chang *et al.* '407 and Chang *et al.* '518 in reconstructing applicants' claim 20.

b. ***Chui et al. and Chang et al. '407 are not properly combinable to teach all of the features as recited in claim 20.***

As discussed *supra*, there is no motivation to combine Chui *et al.* and Chang *et al.* '407. Therefore, both Chui *et al.* and Chang *et al.* '407 are not properly combinable in reconstructing applicants' claim 20.

c. ***Nguyen et al. and Chang et al. '407 are not properly combinable to teach all of the features as recited in claim 20.***

As discussed *supra*, there is no motivation to combine Nguyen *et al.* and Chang *et al.* '407. As such, as outlined in **section V, subsections a, b, and c**, "Chang *et al.* '518 and Chang *et al.* '407" or "Chui *et al.* and Chang *et al.* '407" or "Nguyen *et al.* and Chang *et al.* '407" are not properly combinable. Therefore it is respectfully submitted that claim 20 is non-obvious over the cited art. Accordingly, withdrawal of the rejection with respect to claim 20 is respectfully.

CONCLUSION

For at least the above reasons, the claims currently under consideration are believed to be patentable over the cited references. Accordingly, it is respectfully requested that the rejections of the pending claims be reversed.

For any extra fees or any underpayment of fees for filing of this Brief, the Commissioner is hereby authorized to charge the Deposit Account Number 20-0668, TIP477US.

Respectfully submitted,
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Date: February 15, 2007



Christine Gillroy

VIII. Claims Appendix (37 C.F.R. § 41.37(c)(1)(viii))

1. (Previously presented) A method for cleaning a wafer, comprising:
patterning a via or a trench, or both, in a porous, low-k dielectric layer overlying the wafer;
cleaning a polymer residue from surfaces of the patterned dielectric layer using a wet clean solvent; and
performing a non-plasma anneal on the patterned dielectric layer to remove a component of the solvent prior to a metal deposition, wherein the anneal comprises a low pressure anneal from about one atmosphere of pressure to substantial vacuum.
2. (Previously presented) The method of claim 1, wherein the dielectric layer comprises at least one of: an organosilicate glass (OSG), a methylsilsesquioxane (MSQ) dielectric material, a fluorine-doped silicate glass (FSG), and a silicon-dioxide (SiO₂).
3. (Previously presented) The method of claim 1, wherein the wet clean solvent comprises an acid.
4. (Previously presented) The method of claim 3, wherein the component comprises dimethyl acetamide (DMAC).
5. (Previously presented) The method of claim 1, further comprising:
performing a dry clean of the patterned dielectric layer to remove a photoresist, prior to cleaning the polymer residue.
6. (Previously presented) The method of claim 5, wherein the dry clean comprises a plasma including at least one of: hydrogen, oxygen and an inert gas.

7. (Cancelled).
8. (Previously presented) The method of claim 1, wherein the low-pressure anneal is performed in substantially a vacuum.
9. (Previously presented) The method of claim 1, wherein the anneal comprises a high-temperature anneal.
10. (Previously presented) The method of claim 9, wherein the high-temperature anneal is performed at a higher temperature than a boiling point of the component.
11. (Previously presented) The method of claim 9, wherein the high temperature anneal is performed at a temperature less than or equal to 300 degrees Celsius.
12. (Previously presented) The method of claim 9, wherein the high temperature anneal is at least partially performed at 250 degrees Celsius.
13. (Previously presented) The method of claim 1, wherein the anneal is performed for a duration that does not alter a critical dimension of the patterned dielectric layer and does not cause a metal extrusion.
14. (Previously presented) The method of claim 13, wherein the duration comprises at most three minutes.
15. (Previously presented) The method of claim 1, wherein the anneal excludes an application to the patterned dielectric layer of a plasma generated from at least one of: a radio-frequency energy and a microwave energy.

16. (Canceled).

17. (Previously presented) The method of claim 1, wherein the metal deposition includes a copper deposition.

18. (Previously presented) The method of claim 1, wherein the metal deposition comprises at least one of: a barrier deposition and a metal seed layer deposition.

19. (Canceled).

20. (Previously presented) A method for removing volatile cleanser compounds from a post-etch substrate, comprising:

performing a plasma strip of an exposed low k dielectric material to remove a photoresist residue after an etch of the material;

performing a wet clean process using a fluorine-based solvent to remove a polymer residue of the plasma strip from the material; and

performing a low-pressure, high-temperature, limited-duration anneal after the wet clean process and prior to a metal barrier deposition to remove a component of the fluorine-based solvent from the material, wherein the anneal is exclusive of an application of a plasma generated from one or more of: a radio-frequency (RF) radiation and a microwave radiation.

IX. Evidence Appendix (37 C.F.R. § 41.37(c)(1)(ix))

No additional evidence not already part of the official record is relied upon in the arguments provided herein.

X. Related Proceedings Appendix (37 C.F.R. § 41.37(c)(1)(x))

Not applicable.

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